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POLYZOA.—OBSERVATIONS ON SPECIES DETECTED NEAR BUFFALO, N. Y.

By D. S. KELLICOTT, Ph. D., Buffalo, N. Y.

[PLATE V., FIGS. 4, 5 AND 6.]

The fresh-water Polyzoa, without doubt, occur in perennial waters everywhere in this country. While the number of species is not large, the individuals are quite numerous, so that they afford a source and means of study well-nigh universal. There is scarcely any other natural group that so readily yields as much of interest to the zoölogist. This unusual interest depends upon their unsurpassed forms of beauty, expressed both by gracefulness of outline and of movement; upon variety in details of structure; upon the ease with which these anatomical elements may be demonstrated, owing mainly to their transparency; and, further, upon their surprising provisions for the preservation of the species by ordinary budding, by ova and by that peculiar device, the "statoblasts," which is supplied to meet the vicissitudes of summer and winter; nor is pursuit of the recorded history of their discovery and of their classification without interest.

These animals have been much studied in Europe, but in America they have been quite neglected. Mr. Alpheus Hyatt has said (Proceedings Essex Inst., Vol. IV.): "There is no bibliography of the Phylactolæmata, or in fact of the fresh-water Polyzoa taken together, as far as our own country is concerned. Dr. Leidy is the sole authority upon this subject in America. His observations have given us all the information we at present possess of our native species, besides adding two new and singularly interesting genera, *Pectinatella* and *Urnatella*, to the systematic catalogue." It may be added that Mr. Hyatt's researches have increased considerably the list of American species, and that he has given us in volumes IV. and V. of the Proceedings of the Essex Institute and in the *American Naturalist*, Vol. I., a clear exposition of their structure and systematic relations.

I have prepared this paper principally to call the direct and general attention of the naturalists of this Society to these forms, which will surely add very much to the equipment of any interested microscopist, presenting salient points for his own study of nature, and enabling him to gain and instruct those not possessed of a microscope. This I have done, believing that a majority of those skilled in the use of our royal instrument, are, as opportunities are presented, both willing and useful teachers of nature; and it seems to me that the microscope and the numerous microscopical societies throughout our country are doing very much to spread the study and love of nature, thus leading larger and larger numbers to new life and aspirations. Regard for these things has given direction to the plan of this essay. I have first compiled a brief history of the discovery and classification of the group; then a short account of the structure in general, and the particulars which most distinctly characterize the genera. For these I have depended principally upon the "Monograph of the Fresh-water Polyzoa," by G. J. Allman, and on the "Observations on the Polyzoa, sub-order Phylactolæmata," by Alpheus Hyatt. Finally, I have given my personal observations on the species thus far detected at Buffalo, N. Y., together with notes on species observed in other localities.

The Polyzoa, now separated as a distinct group, were long confounded with the Polypes. It is well-known that corals were regarded as belonging to the vegetable kingdom until near the end of the first half of the last century, when their animal nature was clearly established and the name "polype" applied.

In 1599, the Neapolitan, Ferante Imperato asserted, it is true, that corals possessed the nature of animals, but for more than a century afterwards there appears to have been no doubt that they were plants; indeed, in 1706 Count de Marsigli declared that he had seen corals in flower. This declaration appears to have been unquestioned evidence of their plant-nature until Jean André Peysonelle, physician of Marseilles, saw that the flowers of Marsigli were nothing more than the beautiful starry polypes of the corals, and he maintained that they were true animals of the same nature as the *Actiniæ* whose animality could not be questioned. Peysonelle entrusted his views to Reaumer, who opposed them, and when presenting Peysonelle's communication to the French Academy suppressed the author's name. Among those who did not at once reject these conclusions was the celebrated botanist, Bernard Jussieu, who in 1741 visited the coast of Normandy in order to subject them to the test of actual observation; he was at once convinced of their animality. In communicating the results of his observations he used for the first time the word *Polype* to designate these animals.

At this time Abraham Trembley, engaged in his famous experiments on Hydra, discovered at the Hague (April, 1741), the first fresh-water polyzoön. The beautiful tentacular plume and the supposed intimate relation with the polypes suggested the name *Polype à Panache* by which he designated it. Very soon afterwards, Baker, in England, discovered the same species which he described and named the Bell-flower Animal.

It is worthy of note that Linnæus was not convinced of the animality of the corals by the discoveries referred to, but still held to their vegetable nature. Not until after the publication of the discoveries of John Ellis (1752-55), did he make a partial admission, maintaining their double nature; that their stems and branches grew by a true vegetation, and possessed the essential characters of plants, while the polypes were certain inflorescences or developments of the vegetative axis in which the vitality had become exalted from the vegetable into the animal.

During the succeeding century many new species were discovered, yet, notwithstanding the clear expositions of structure by Baker, Trembley and others, it was not seen that there were two distinct types among these polypoidal animals.

In March, 1827, Prof. Grant read a memoir before the Wernerian Society on the Structure of the Flustræ, in which he also showed certain species to be quite different from the hydroid polypes of the Sertularidæ.

In September, 1828, M. Edwards presented to the French Academy of Sciences his researches upon the anatomy of Flustræ, and he was the first to call attention to the close connection of the structure with that of the Ascidiæ, and the important bearing of this connection on their systematic rank.

In 1830, Mr. J. V. Thompson published a paper "On Polyzoa, a new Animal Discovered as an Inhabitant of some Zoöphytes." He traced the entire course of the alimentary canal, and made himself master of almost every important point in their structure. He also perceived their close relation to the compound Ascididæ. As he was the first to use the designation "Polyzoa," together with a description of structure showing their complete distinctness as a group; the name thus proposed must stand.

In 1834, Ehrenberg published his memoir on the corals of the Red Sea, in which he divided the group into two great sections, Anthozoa and Bryozoa; the latter term he had used in 1831, thus giving Thompson's name priority.

In 1834, DeBlainville, although still continuing to associate them with the Radiata, set off the genera *Cristatella*, *Plumatella* and *Alcyonella* as a sub-class, styling them "*Polypiaires douteaux*."

In 1837, Gervais divided the *Polyzoa* into two sub-classes, the one with lateral arms (Polypiaires hypocrepia), the other with round lophophore (Polypiaires infundibulati); among these, in error, he placed *Fredericella*. This genus was restored to its proper division by Dumortier and Van Beneden (1848); but they, in error, united it with *Paludicella*, which genus is without epistome, and has a truly orbicular lophophore.

In 1856, Prof. Allman, in his Monograph, classified the group thus:

Order, PHYLACTOLÆMATA. Sub-orders, LOPHOPEA, fresh-water.
" PEDICELLINEA, marine.
" GYMNOTÆMATA. " URNATELLEA, fr. water.
" PALUDICELLEA, "
" CYCLOSTOMATA, marine.
" CTENOSTOMATA, "
" CHEILOSTOMATA, "

Sub-order, PALUDICELLEA.	Fam., *Paludicellidæ.*	Gen., *Paludicella.*
“ URNATELLEA.	“ *Urnatellidæ.*	“ *Urnatella.*
“ LOPHOPEA.	“ *Plumatellidæ.*	“ *Fredericella.*
		“ *Plumatella.*
		“ *Alcyonella.*
		“ *Lophopus.*
		“ *Pectinatella.*
	“ *Cristatellidæ*	“ *Cristatella.*

In the paper already referred to by Alpheus Hyatt, the first order is somewhat differently divided, and it seems for good reasons, thus:

Sub-order, PHYLACTOLÆMATA.

1st family,	FREDERICELLIDÆ.	Genus, *Fredericella.*
2d “	PLUMATELLIDÆ.	Genera, *Plumatella.*
		“ *Lophopus.*
		“ *Pectinatella.*
3d “	CRISTATELLIDÆ.	Genus, *Cristatella.*

Plumatella includes *Alcyonella*, as it contains only varieties of the several species of that genus. The nomenclature adopted by Prof. Hyatt differs somewhat from that of Prof. Allman. The reasons for the change, he puts thus: “Partly in consequence of a different view with regard to the composition of the organs, and partly because I have adopted the views originated by E. S. Morse, with regard to the relations of the anterior and posterior poles of the body. Prof. Morse has arrived at the conclusion that the attached end of a Polyzoön is in reality the anterior, and that the peduncular end of a Brachiopod is the homologue of this, and also anterior. It therefore becomes necessary to alter the commonly-received nomenclature, and to denominate the attached end of a Polyzoön the anterior; the anal side the dorsal, and the opposite, or so-called hæmal side, the ventral.” In this paper I have attempted to follow this classification and nomenclature.

It does not appear by whom they were first withdrawn from the *Radiata* and placed among the *Mollusca.* They are now, with other aberrant forms, regarded as worms. In the recent Zoölogy by Dr.

A. S. Packard, Jr., the *Polyzoa* stand as Class IV. of Branch V., *Vermes*, the class *Rotatoria* preceding, and class *Brachiopoda* following.

I shall next present a condensed outline of the structure of a Polyzoön, and to accomplish this, I cannot do better than to first copy the following general description from Allman's *Monograph of the Fresh-water Polyzoa:* " Let us imagine an alimentary canal, consisting of œsophagus, stomach and intestines, to be furnished at its origin with long ciliated tentacula, and to have a single nervous ganglion placed upon one side of the œsophagus. Let us now suppose this canal to be bent back upon itself, toward the side of the ganglion, so as to approximate the termination to the origin. Let us further imagine the digestive tube thus constituted to be suspended in a fluid contained in a membranous sac with two openings, one for the mouth and the other for the vent, the tentacula alone being external to the sac. Let us still further suppose the alimentary tube, by means of a system of muscles, to admit of being retracted or protruded, according to the will of the animal; the retraction of the sac being accomplished by an invagination of the sac, so as partially or entirely to include the oral tentacles within it, and if to these characters we add the presence of true sexual organs, in the form of ovary and testis, occupying some portion of the interior of the sac, and the negative character of the absence of all vestige of a heart, we shall have, perhaps, as correct an idea—apart from all considerations of homology or derivation from an archetype— as can be conveyed of the essential structure of a *Polyzoön* in its simplest and most generalized condition."

The immediate investing sac, the *endocyst*, in most species secretes an outer-incrusting layer, the *ectocyst*, these together constitute the *cœnœcium* protecting the individuals and binding them into colonies. The cœnœcia vary much and afford plain generic and specific distinctions. In *Paludicella* it is tubular, brown, thin, somewhat coreaceous, divided by partitions into distinct cells, branching at nearly right angles to the trunk, either attached or in part free; in *Fredericella* generally brown, coreaceous, dendritically branched and without partitions, a negative character common to all the other tubular colonies; in a part of the *Plumatellæ* it is similar to that of *Fredericella*, while in others it remains colorless, more or less lobiform, with ectocyst gelatinous; in *Lophopus*, branching lobate, with the ectocyst very thick, gelatinous and colorless; in *Pectinatella*. a somewhat lobate sac, colorless, with the ectocyst, at least in old colonies, a gelatinous sheet, serving for a support for the colony; in *Cristatella* naked sacs capable of determinate motion through muscular fibers in walls of the cells, ectocyst transient gelatinous secretion from the base of the colony.

The alimentary canal is bent upon itself, suspended upon the lophophore, it floats free in the fluid of the perigastric cavity. The mouth of each polypide is surrounded by long, slender, very flexible, ciliated tentacles, united towards their bases by a funnel-shaped membrane called the *calyx*. The stage bearing the tentacles and affording attachment to muscles, etc., is the *lophophore*, which is either circular or horse-shoe-shaped; thus in *Paludicella* and *Urnatella* the tentacles stand in a circle, in *Fredericella* in nearly a circle, in all other fresh-water forms, in a crescent. The number of tentacles varies from sixteen in *P. Ehrenbergii* to ninety in *C. ophidioidea*.

The mouth is situated in the center or angle of the lophophore. It may be closed by a tongue-like lid, which is a fold of the lophophore. This lid is the *epistome*; it is absent in *Paludicella* and *Urnatella*.(?) The œsophagus is a cylindrical cavity, ciliated above, shorter than the stomach, into which it opens through the œsophagal valve, formed by the projecting walls of the canal. "The stomach may be typically considered as a single tubular cavity, with an anterior flexure near the pyloric end, and the anterior side of this flexure prolonged into a gourd-like cœcum of great size and length. The intestine varies more in form than either the œsophagus or stomach, but is universally broad below, and tapering towards the anus," (Hyatt.) The passage from the stomach to the intestine is guarded by a valve similar to the œsophagal; it is the pyloric.

The muscular system is well developed and consists of various bands and fasiculi. I can barely mention some of these: The sphincter closes the external opening of the cell after the retraction of the polypide; the two sets of large retractor muscles, one on each side of the digestive canal, arise from near the base of the cell; each trunk subdivides into three branches, which control the motion and position of the alimentary canal, move the tentacles from side to side, or withdraw the polypide into the cœnœcium.

The nervous system consists of a single small ganglion, or in "all the Hypocrepia of two ganglia united by a commissure" placed upon the dorsal or anal side of the œsophagus, and giving off anterior sets of fibers distributed to the digestive tubes, and posterior sets, distributed to the epistome and lophopore.

The Polyzoa increase: (1), by budding, thus multiplying the individuals of a colony; (2), by eggs, and by statoblasts or winter eggs, both of which establish new colonies. The latter are of importance in defining the genera and in distinguishing the species, hence I take the space for a brief description.

These bodies arise as buds from the funiculus, or cord-like prolongation of the stomach, extending to near the base of the retractors. Seen from the edge, they are generally somewhat lenticular, from above they are elliptical to circular, in *Pectinatella magnifica* they are somewhat quadrate.

"The cell contents are enveloped by a cellular membrane, with an outer gelatinous envelope. Between these, two other membranes are secreted, one of which constitutes the horny sheath, and the other the annular ring of the stabolast. This sheath and the annulus gradually assume a distinct cellular structure, and a horny consistency, (Allman).

In *Fredericella* the statoblasts are without apparent annuli, in *Paludicella*, *Plumatella* and *Lophopus* the annulus is present, but without appendages; while those of *Pectinatella* and *Cristatella* have the border of the annuli armed with hooks, one row in the former and two in the latter. These bodies are most abundant in autumn. They float and are often found on water-plants; they are occasionally seen in the water-supply of cities.

Besides these floating or free statoblasts, there is another sort arising from the lower side of the cell, instead of the funiculus, as they remain attached to the colonial support after its decay, they are called fixed-statoblasts. They differ materially from the free ones. Allman states the difference thus: "These differ from the unattached statoblasts in shape, being much broader in proportion to length, while the annulus is exceedingly narrow, and presents but a slight trace of that highly-developed cellular structure so remarkable in the others."

All the Polyzoa are hermaphrodite, the ovary and the male gland residing in the same cystid, the former being situated near the upper part of the cell, attached to its walls, the latter being situated near the bottom, attached near the base of the funiculus.

Finally, I shall add personal observations on particular species.

Paludicella Ehrenbergii, Van Beneden.

This cosmopolitan species occurs in abundance on loose stones along the Niagara River, particularly along the pier separating the ship-canal and river. It is usually found closely attached throughout the length of the colony; but sometimes the colony is mostly free, appearing like slight flocks of brown hair. In the Shiawassee River, in Central Michigan, I found it abundant on the under side of stones, associated with roots of a water-moss, so it was hard to distinguish them without a glass.

The characteristics of the species are the brown coreaceous cœnœcium, with claviform cells placed end to end, the branches standing out at right angles to the trunk; the orifices are placed at one end of the cell, projecting obliquely outwards. The contiguous cells are separated from each other by membranous partitions. There are sixteen tentacles situated on a circular lophophore. The statoblast appears to have been rarely seen; the only notice of it which I have met is by Edward Parfitt, in *Annals and Magazine of Nat. History*, 1866. The description is as follows : "The outline is a very elongated ellipse; the cell very small, as compared with the very broad border, plano-convex; the cell, reddish-brown; the annulus or border, bluish purple, beautifully reticulated and reflecting the prismatic colors. They were arranged three in each tube, placed end to end."

This polyzoön is a very timid animal, and often will not display its delicate calyx for hours after removal to the stage of the microscope. In this it differs widely from those species with gelatinous ectocyst,—for example, *Plumatella vitrea*.

I find our form to agree with Allman's description and figures.

Fredericella regina, Leidy.

This species I have found to occur abundantly near Buffalo, particularly on loose stones in a quiet bay at the head of Squaw Island and in Scajaquada Creek. It is usually associated with *P. aiffusa*. The colonies are either attached throughout, or mostly free. The cœnœcium is dendritically branched, brown, with the cells rather long. While *regina* is not so timid as *Ehrenbergii*, it does not so readily display its beautiful proportions under the microscope as the species mentioned below. Only varieties *a* and *b* of Hyatt have been observed.

Recently I found what I take to be this species, at Corunna, Mich., on the under side of pond-lily leaves; the colonies were small and free.

Plumatella diffusa, Leidy.

I have found *diffusa* in ponds and streams very abundant all about Buffalo; also in Shiawassee River, and ponds and lakes at the head of Little Traverse Bay, Mich. Under loose stones along the Niagara it often forms thin, gelatinous sheets, extending over the entire exposed surfaces; it is not unusual to find the tubes of this species growing up through a mass of some fresh-water sponge, species of which are abundant in the same locality; in other instances the sponge appears to have outgrown the polyzoön, the lifeless tubes being buried beneath the flesh and statoblasts of the latter. This species is often found under floating boards, on snags and on water-plants. I find it varies much, especially in the branding of the colonies and the character of the ectocyst. Hyatt describes two distinct varieties; "Variety *a*, from brooks, has distinct cells, with tough brown ectocyst, and branches diffuse and rarely adherent." The pond variety *b*, "were much denser growths; the branches generally adherent, the ectocyst colorless, and, in several specimens from Mystic Pond (living in brackish water) the branches were so closely packed that the colonies formed their gelatinous sheets of considerable extent, in which no branches could be traced from above." The same author finds the statoblasts to vary from .199 $^{m\,m.}$ in breadth by .333 $^{m\,m.}$ in length, to .249 $^{m\,m.}$ in breadth by .349 $^{m\,m.}$ in length. I have found the variation, particularly the ratio of width to length, to be much less; indeed, the statoblasts, from examples taken from our river, are quite constant in both size and form. Width, .24 $^{\mathrm{mm.}}$; length, .35 $^{\mathrm{mm.}}$

Plumatella arathusa, Hyatt.

This species was taken from Park Lake in September last. The forms agree with the author's variety *b*, "branches and cells adherent, forming thick incrustations; the cells, however, appear to be distinct." The statoblasts are said to vary "from .199 $^{\mathrm{mm.}}$ in breadth to .266 $^{\mathrm{mm.}}$ in length, to .266 $^{\mathrm{mm.}}$ in breadth by .399 $^{\mathrm{mm.}}$ in length." By carefully measuring a series removed from the tubes, and evidently mature, I obtained an average width of .262 $^{\mathrm{mm.}}$; length, .401 $^{\mathrm{mm.}}$; extremes: width, .250 to .269 $^{\mathrm{mm.}}$; length, .387 to .404 $^{\mathrm{mm.}}$

Plumatella vitrea, Hyatt.

This distinct and most lovely species occurs frequently during August and September, in a bay at the head of Squaw Island. I have found it on stones and snags; occasionally it occurs on water-plants, particularly on *Ceratophyllum demersum.* It is adapted to advantageous study, on account of its transparent ectocyst, and the fact that it is less timid than most *Plumatellæ.* It occurs in long, yellowish, gelatinous lines, seldom intersecting, often of many inches in length, it is not easily mistaken for any other of our forms; those running down the stems of the *C. demersum*, and often out on its verticillate leaves, have the aspect of *C. ophidioidea*, found in small colonies in the same locality in similar situations. The statoblasts are large, but with this, as with *diffusa* and *arathusa*, I find less variation in relative width to breadth. I find the average size of ten examples, taken at random, as follows: Width, 365 $^{\mathrm{mm.}}$; length, .556 $^{\mathrm{mm.}}$; extremes: width, .364 to .366 $^{\mathrm{mm.}}$; length, .538 to .575 $^{\mathrm{mm.}}$ The greater variation in length appeared to be due to a defect in the annulus at the ends.

Plumatella orbisperma, *n. sp.*, or new variety.

I have used this name for a form recently found in a pond on the border of Little Traverse Bay, Mich. A study of the polypide and cœnœcium does not enable me to separate it with certainty from *P. arathusa*, Hyatt, or *P. vesicularis*, Leidy, the latter of which

I have not seen. It occurs on the under side of floating boards, along with *diffusa;* the cœnœcium is colorless, cells apparently distinct, yet compact; the cœnœcium extends right and left from its origin in two or three slightly-radiating, sparingly-branched trunks, with the cells somewhat in clusters, often opposite. Colonies small. The colorless ectocyst is not so thick as in *vitrea.* Tentacles about sixty. Statoblast nearly circular; width, .320 $^{\text{m m.}}$; length, .343 $^{\text{m m}}$ The greatest variation in a large number measured was: width, .325 $^{\text{m m.}}$; length, 360 $^{\text{m m.}}$ When seen from the edge, it is quite nearly equally convex.

I have thought this form distinct, mainly upon the character of the statoblast, which appears to be quite different from any yet described. If this character is not sufficient for its separation, it will probably prove to be a variety of *P. vesicularis.*

I observed one statoblast worthy of special mention; the brown valve was yet transparent in the center, permitting the contents of the cell to be plainly seen; there was a cellular globular body moving energetically about its cavity by means of its ciliated surface. This motion was observed, at intervals, for ten hours. Finally it ceased altogether, and the mass broke up (Plate IV., fig. 4.) This body called to mind a statement from Allman's Monograph: "In *Alcyonella fungosa* and *Lophopus crystallinus* I have also occasionally seen bodies which differ from ordinary statoblasts of these Polyzoa, by the possession of a regular elliptical opening in the center of the more convex face. They were always empty, and of their natures I have not been able to form a conclusion. They are probably abnormal."

Pectinatella magnifica, Leidy,

I have found abundant along the river in autumn, occurring only in quiet water where there is abundant life. It is found as often on submerged stones as on old wood, and has been found recently in abundance on *Vallisneria spiralis* in Rattlesnake Creek, a few miles below the city. The colonies observed here are invariably small. It is usually said that the colonies are fixed, but I am sure that they move slowly when young. This observation was made: A fragment of bark bearing three small colonies was suspended in a jar of water.

After a few hours it was observed that all had changed places. By the end of two days one group had passed around the edge to the other side, while another had moved over the thread suspending its support, thus sealing the fact of its free movement. It is well said by Hyatt that, "The reproduction and vital energies of the group reach their climax in the voluptuous beauty and endless multiplication of the cœnœcia in *Pectinatella.*" In one instance I saw an immature statoblast in which the growing hooks were pushing the investing membrane out into conical projections, while over the surface the ciliary motion was quite decided (Plate IV., fig. 5).

Cristatella ophidioidea, Hyatt.

This form is not one whit less interesting than the last, and was found last September in the same locality on the same supports. The colonies are readily distinguished, however, by a difference in color and the longer sigmoid shape. The colonies move about, yet not so freely as *C. mucedo* of Europe is said to move. I have found the colonies on water-weeds, especially *C. demersum.* A stem of this plant bearing a colony was suspended in a jar of water, the colony moved up and down the stem, and finally divided into two. I have seen the immature statoblasts surrounded by a ciliary membrane, similar to the young statoblast of *mucedo*, and quite the same as the one referred to above as that of *magnifica* (Plate IV., fig. 6).

By leaving several small colonies of this and the last preceding species in a limited quantity of water, it was observed that statoblasts were produced rapidly and in large numbers shortly before the death and disintegration of the groups.

This paper is presented without the expectation of giving much that is really new. I end it by re-stating the hope that it may prove useful to some other amateur zoologist.

EXPLANATION OF PLATE IV.

Fig. 1. *a*, *Rhizosolenia Eriensis*, H. L. S.
b, *b'*, *Rhizosolenia gracilis*, H. L, S.

Fig. 2. Statosphere of *Spongilla Ottawaensis*, Dawson, containing three (a) statoblasts: t, t, t, foramenal openings with short bent tubes turned upward.

Fig. 3. Diagrammatic representation of statoblast of *Carterella tubisperma*, Mills: *c*, globular statoblast surrounded with birotulate spicula, one end of which rests on the chitinous coat *a*; *b*, tube of statoblast, which is a continuation of the chitinous coat: *d*, cirrous processes at the end of tube, not accurately drawn for any species. Other species referred to in the text as *Carterella tenosperma* and *C. latitenta* of Mr. Potts have shorter tubes, but with processes very much longer. *C. latitenta* has processes *wide* and *ribbon-like*, near the connection with the short tube.

Fig. 4. Statoblast of *Plumatella orbisperma*, D. S. K. *a*, annulus; *b*, ciliate body moving about the cavity; *c*, a small one also ciliate.

Fig. 5. Statoblast of *Pectinatella magnifica*, Leidy, with the hooks pushing up the gelatinous covering, showing cilia at *c*; *a*, annulus; *s*, horny sheath.

Fig. 6. Statoblast of *Cristatella ophidioidea*, Hyatt, before the spines appeared, surrounded by a ciliated membrane; *c*, cilia well seen at the edge.

PLATE IV.

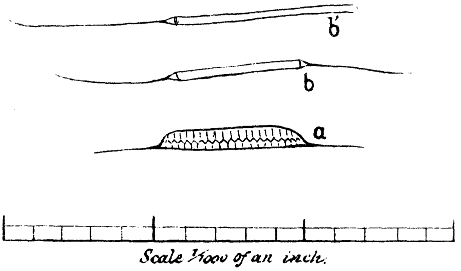

FIG. 1.

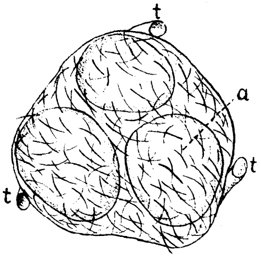

FIG. 2. × 52.

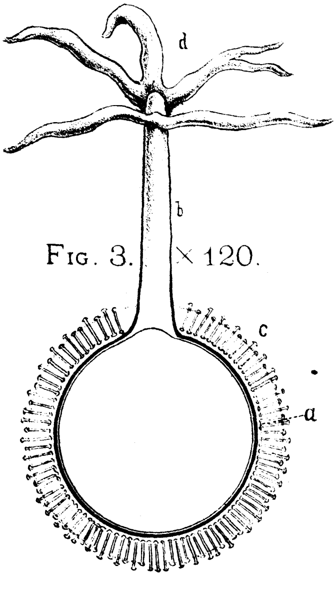

FIG. 3. × 120.

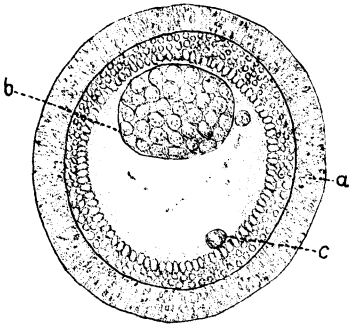

FIG. 4. × 116.

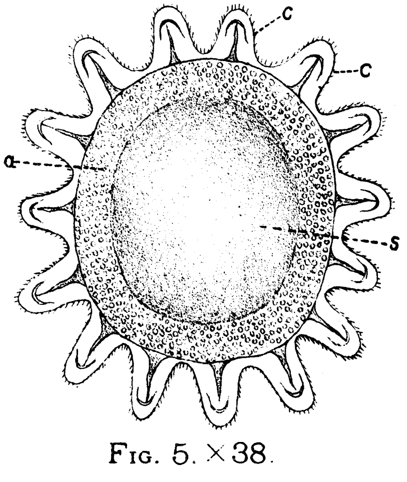

FIG. 5. × 38.

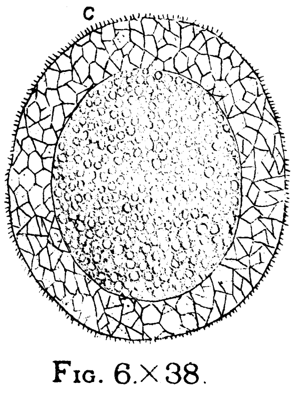

FIG. 6. × 38.